CHAPTER 5
ANOMALY AVOIDANCE PROCEDURES DURING HTRW ACTIVITIES

5-1. Introduction.

a. This chapter discusses anomaly avoidance procedures during the investigative/design phase of any project on a site with known or suspected UXO. USACE primarily implements anomaly avoidance procedures on HTRW sites with the potential to encounter UXO. HTRW-related activities during the investigative/design phases with the potential for encountering UXO include, but are not limited to, surveying and mapping, environmental and natural resource assessments, surface and subsurface sampling, boring and drilling, and groundwater monitoring.

b. The purpose of anomaly avoidance during HTRW activities is to avoid any potential surface UXO and subsurface anomalies during sampling activities. Intrusive anomaly investigation is not authorized during anomaly avoidance operations. Procedures for addressing explosives contaminated soils are addressed in paragraph 1-1d of this pamphlet.

5-2. Team Composition. For anomaly avoidance on an HTRW site with known or suspected UXO, the contractor will provide a team consisting of a minimum of two personnel, one of whom must be a qualified UXO Technician II or above. This individual will be the team leader. The team must be on-site during all sampling activities. The team may include additional UXO qualified personnel, depending on site and task specific conditions/requirements. A description of the qualifications for contractor UXO personnel is provided on the OE MCX website at http://www.hnd.usace.army.mil/oew.

5-3. Responsibilities. The team members have the following responsibilities for anomaly avoidance procedures during an HTRW investigation project on a site with known or suspected UXO:

a. Prepare a Work Plan to supplement the prime contractor's or USACE Work Plan/Site Plan as described in Chapter 3.

b. Provide the explosive ordnance recognition, location, and safety functions for the prime contractor during HTRW sampling activities.

c. Conduct UXO safety briefings for all site personnel and visitors.

5-4. Authority. The senior UXO qualified person has final on-site authority on OE matters.

5-5. Access Surveys. The team must conduct a surface access survey and a subsurface survey for anomalies before any type of activities commence, including foot and vehicular traffic.

a. HTRW sampling personnel must be escorted by UXO qualified personnel at all times in areas potentially contaminated with UXO until the team has completed the access surveys and the cleared areas are marked. Escorted HTRW personnel will follow behind the UXO escort. If anomalies or UXO are detected, the UXO escort will halt escorted personnel in place, select a course around the item, and instruct escorted personnel to follow.

b. The team will conduct an access survey of the footpath and/or vehicular lanes approaching and leaving HTRW sampling areas with known or suspected UXO contamination. The access route shall be at least twice as wide as the widest vehicle that will use the route.

c. The Team must also complete an access survey of an area around the proposed investigation site that is large enough to support all planned operations. The size of the surveyed area will be site-specific and will take into account, for example, maneuverability of required equipment (e.g., drill rigs, excavation equipment, etc.), parking of support vehicles, and establishment of decontamination stations. As a minimum, the surveyed area should have a dimension in all directions equal to twice the length of the longest vehicle or piece of equipment to be brought on-site.

d. Geophysical instrumentation capable of detecting the smallest known or anticipated UXO will be used to locate anomalies just below the surface that may be encountered through erosion from rain or continual vehicular traffic. The various types of geophysical detection equipment are presented in Chapter 4.

e. If anomalies or surface UXO are encountered, they will be marked with flagging and the investigation area will be relocated to avoid contact. The team will clearly mark the boundaries of the surveyed area using survey flagging and pin flags. The team will establish a system of flagging colors that will distinguish anomalies, surface UXO, and route boundaries from each other as well as from any utility markings that have been used at the site.

f. If surface UXO is encountered, the team will assess the condition of the UXO to determine if disposal action is required. UXO disposition will follow the procedures in paragraph 5-12.

g. No personnel will be allowed outside of the surveyed areas.

5-6. Surface Soil Sampling. Surface soil samples are normally collected at depths from zero to six inches below ground surface. The following paragraphs describe anomaly avoidance procedures for soil sampling between zero and six inches below ground surface on an HTRW site with known or suspected UXO. Soil sampling at depths greater than six inches below ground surface on an HTRW site with known or suspected UXO will follow the procedures in paragraph 5-9.

a. The team must conduct an access survey of the routes to and from the proposed investigation site as well as an area around the investigation site, as described in paragraph 5-5.

b. The team must visually survey the surface of each proposed surface soil sampling site for any indication of UXO or UXO-related contamination. In addition, the team must conduct a survey of the proposed sample locations using geophysical instrumentation capable of detecting the smallest known or anticipated UXO to a depth of one foot. The various types of geophysical detection equipment are presented in Chapter 4.

c. If anomalies are detected at a proposed sampling location or too many anomalies are detected in a general area of interest, the HTRW personnel will select an alternate location for collection of surface soil samples. Any anomalies detected will be prominently marked with survey flagging or pin flags for avoidance during HTRW sampling activities.

5-7. Passive Soil Gas Sampling. Passive soil gas sampling typically involves excavation of holes to a depth of less than five feet and the installation and subsequent removal of sampling canisters. The following paragraphs describe anomaly avoidance procedures for passive soil gas sampling on an HTRW site with known or suspected UXO.

a. The team must conduct an access survey of the routes to and from the proposed investigation site as well as an area around the investigation site, as described in paragraph 5-5.

b. The team must visually survey the surface of the proposed passive soil gas sampling sites for any indication of UXO or UXO-related contamination. In addition, the team must conduct a survey of the proposed sample locations using geophysical instrumentation capable of detecting the smallest known or anticipated UXO to the specified emplacement depth for the sampling canister. The various types of geophysical detection equipment are presented in Chapter 4.

c. If the emplacement depth is greater than the geophysical instrumentation detection capabilities, then the team must incrementally complete the geophysical survey every two feet while excavating for emplacement of the sampling canisters. Non-essential project personnel should withdraw to a distance of not less than the fragmentation distance of the MPM established for the site during excavation for the incremental geophysical survey.

d. If anomalies are detected at a proposed sampling location or too many anomalies are detected in a general area of interest, the HTRW personnel will select an alternate location for collection of passive soil gas samples. If an anomaly is detected during an incremental geophysical survey, the hole will be backfilled in accordance with site-specific procedures. Any anomalies detected will be prominently marked with survey flagging or pin flags for avoidance.

e. Unless a path is clearly marked, the HTRW sampling personnel must be escorted by UXO qualified personnel when they subsequently return to each soil gas sampling site to retrieve the sampling canisters.

5-8. Active Soil Gas Sampling and Direct Push Technology. Active soil gas sampling typically involves manual or mechanical penetration at the desired location followed by withdrawal and collection of a soil gas sample. Direct push technology (DPT) is a common method for mechanical penetration during active soil gas sampling. The following paragraphs describe anomaly avoidance procedures for active soil gas sampling and use of DPT on an HTRW site with known or suspected UXO.

a. The team must conduct an access survey of the routes to and from the proposed investigation site as well as an area around the investigation site, as described in paragraph 5-5.

b. Active soil gas sampling and DPT installations will follow the same anomaly avoidance procedures as outlined below for soil boring and monitoring well installations. The actual sampling will occur through the pilot hole or a boring located within a two-foot radius of the pilot hole installed by the team. If the pilot hole cannot be used to obtain a representative soil gas sample, it must be backfilled in accordance with site-specific procedures prior to installation and sampling of the soil gas sampling point. The backfilling of the pilot hole should be performed to prevent the soil gas sampling from being diluted by atmospheric air that may be drawn in through the pilot hole. Following collection of the soil gas sample, the sampling location must be backfilled in accordance with site-specific procedures.

5-9. Subsurface Soil Sampling and Monitoring Well Installation. Subsurface soil sampling is defined as the collection of samples below a nominal depth of approximately six inches from a split-spoon, Shelby tube, or bucket auger soil sampler using drilling techniques. Drilling techniques are also used to install groundwater monitoring wells for HTRW investigative sampling. The following paragraphs describe anomaly avoidance procedures for subsurface soil sampling and monitoring well installations on an HTRW site with known or suspected UXO.

a. The team must conduct an access survey of the routes to and from the proposed investigation site as well as an area around the investigation site, as described in paragraph 5-5.

b. The team must complete a subsurface geophysical survey of the proposed drill hole location(s). If an anomaly is detected, HTRW sampling personnel must select a new drill hole location. Any anomalies detected will be prominently marked with survey flagging or pin flags for avoidance. If the subsurface sampling or well installation depth is greater than the geophysical instrumentation detection capabilities, the team must incrementally complete the geophysical survey as outlined below.

(1) Underground Utilities. Utility clearance and/or excavation permits, if required, must be obtained prior to the commencement of any incremental subsurface geophysical survey activities by the team. The team is responsible for verifying that all necessary excavation permits are on-site prior to commencing operations. The prime contractor is responsible for contacting the appropriate agency(ies) or company(ies) to mark the location of all subsurface utilities in the construction area. All located utilities should be marked by paint, pin flags, or other appropriate means to visually delineate their approximate subsurface routing. The color shall not conflict with the colors used in UXO activities. In the event subsurface utilities are suspected in an excavation area, the team must attempt to verify their location. The team should be aware that not all utility lines will be detectable with geophysical equipment (i.e., not all utility lines are constructed of ferrous material).

(2) Pilot Hole/Incremental Geophysical Survey. Once an access survey has been completed, the team will install a pilot hole at each proposed drill hole location. During installation of the pilot hole, non-UXO qualified personnel should withdraw to a distance of not less than the fragmentation distance of the MPM established for the site.

(a) The pilot hole will be installed using a manual or mechanical portable auger. During installation of the pilot hole, a geophysical instrument configured for down-hole utilization will be used to inspect for anomalies every two feet.

(b) If an anomaly is detected, the pilot hole will be backfilled in accordance with site-specific procedures and HTRW sampling personnel must select a new drill hole location. Any anomalies detected will be prominently marked with survey flagging or pin flags for avoidance.

(c) As long as no anomalies are detected, the pilot hole will be advanced to the maximum reach of the auger or to the maximum depth of the proposed drill hole, whichever is less. The pilot hole will also be inspected upon reaching the final depth, providing a total clearance depth equal to the pilot hole depth plus two feet. If no anomalies are detected to the total depth of the proposed drill hole, the drill rig may be brought on-site and utilized.

(d) In cases where the pilot hole does not reach the full depth of the proposed boring (e.g., the proposed depth of the drill hole is more than the maximum depth of the auger or the team cannot penetrate the soils using the auger), the drill rig may be brought on-site and advanced in two-foot increments beyond the clearance depth of the pilot hole. At the end of each two-foot increment, the drill rig's augers must be withdrawn from the hole so that the team may screen for anomalies as described above. As necessary with loose soils, a polyvinyl chloride (PVC) pipe (minimum 3 inches inner diameter) may be inserted to keep the hole open and to allow for incremental geophysical screening.

(e) Incremental screening may be discontinued once the drilling has extended to depths greater than 30 feet below ground surface, a geologist determines that virgin soil is found, or the

depth of penetration is exceeded, whichever is greater. All pilot holes will be backfilled in accordance with site-specific procedures.

(3) Monitoring of Drilling by Others. Once the team determines that a proposed drill hole location is free of anomalies using the procedures described above, the drilling contractor will be notified that the site is available for subsurface sampling or monitoring well installation.

(a) The drilling contractor's actual drill hole must be located within a two-foot radius of the pilot hole installed by the team. While this proximity to the pilot hole may affect the accuracy of "blow counts" for the HTRW team, anomaly avoidance takes precedence.

(b) Any drilling beyond the clearance depth of the pilot hole will be conducted in two-foot increments to allow the team to screen for anomalies. In order to avoid magnetic interference from the augers, the drill rig must withdraw its augers from the hole for the geophysical survey. As necessary with loose soils, a PVC pipe (minimum 3 inches inner diameter) may be inserted to keep the hole open and to allow for incremental geophysical screening. Drilling equipment and/or metallic support materials (e.g., drill rig, augers, drill rods, casings, etc.) may create an interference affecting the operation of the geophysical survey instrumentation during the incremental inspection process. In such an event, the item(s) creating the interference must be relocated outside the interference range of the geophysical instrument during each incremental inspection of the drill hole. If an anomaly is detected, the drill hole will be backfilled in accordance with site-specific procedures and HTRW sampling personnel must select a new drill hole location.

(c) Incremental screening may be discontinued once the drilling has extended to depths greater than 30 feet below ground surface, a geologist determines that virgin soil is found, or the depth of penetration is exceeded, whichever is greater.

5-10. Test Pit and Trench Excavations. Test pits and trench excavations are used to identify and characterize large subsurface HTRW areas of concern. The following paragraphs describe anomaly avoidance procedures for test pit and trench excavations on an HTRW site with known or suspected UXO.

a. The team must conduct an access survey of the routes to and from the proposed investigation site as well as an area around the investigation site as described in paragraph 5-5.

b. The team must complete a subsurface geophysical survey of the proposed excavation locations. If an anomaly is detected, HTRW sampling personnel must select a new excavation location. Any anomalies detected will be prominently marked with survey flagging or pin flags for avoidance. If the proposed excavation depth is greater than the geophysical instrumentation detection capabilities, the team must incrementally complete the geophysical survey as outlined below.

(1) Underground Utilities. The procedures outlined in paragraph 5-9b(1) will be followed.

(2) Excavation Procedures. Once an access survey has been completed, HTRW personnel may begin excavation in two-foot increments. During excavation, personnel not directly involved in the excavation activities should withdraw to a distance of not less than the fragmentation distance of the MPM established for the site.

(a) At the end of each two-foot increment, the team will screen for anomalies. If an anomaly is detected, HTRW sampling personnel must modify the excavation location to avoid the anomaly. Any anomalies detected will be prominently marked with survey flagging or pin flags for avoidance.

(b) If UXO is uncovered in an excavation, all operations will cease. The team will assess the condition of the UXO to determine if disposal action is required. UXO disposition will follow the procedures in paragraph 5-12. Once UXO has been encountered in an excavation, no further excavation is allowed at that location until EOD has removed the UXO item. Once the item is removed, excavation may continue using anomaly avoidance techniques. The After Action Report will indicate that UXO was encountered and summarize resulting activities.

c. Waste and/or Other Materials Encountered. In the event potentially hazardous waste, debris, or drums are encountered during test pit or trenching operations, excavation activities will cease. The HTRW Site Safety and Health Officer (SSHO) will assess the situation and may direct a change to the PPE for site workers. The SSHO will notify the appropriate personnel in accordance with the site-specific work plan. Wastes will be handled in accordance with the site-specific investigation-derived waste (IDW) management plan.

5-11. Groundwater Monitoring/Aquifer Characterization. Groundwater monitoring activities include measurement of groundwater elevations, measurement of free product thickness, and collection of analytical samples. Groundwater monitoring wells may also be used for aquifer characterization activities (e.g., slug tests). Unless a path is clearly marked, the HTRW sampling personnel must be escorted by UXO qualified personnel as described in paragraph 5-5a when they subsequently return to conduct groundwater monitoring/aquifer characterization activities.

5-12. UXO/OE Disposition. Since the purpose of UXO support during HTRW activities is anomaly avoidance, the team is not tasked to perform UXO/OE disposition. UXO/OE disposition will not be covered in the planning documents for the project, and therefore the team is not capable or equipped to perform UXO/OE disposition. In the event that ordnance is encountered that cannot be avoided or, based on its fuzing or current condition, presents an imminent hazard requiring immediate attention, the team will notify the local POC designated in the Work Plan. The team will not destroy any of the UXO encountered. The local POC will notify the appropriate authority of the UXO discovery and the team will safeguard the site pending arrival of the appropriate authority.

a. On active installations, UXO disposition requests will normally require reporting to the Range Control Officer, Facility Engineer, Post Headquarters or POC designated in the Work Plan.

b. On FUDS, the local POC will facilitate EOD response. If the local POC designated in the Work Plan is not the local law enforcement agency, the local POC will inform the local law enforcement agency of the discovery. The local POC will also contact the USAESCH Safety Manager.

5-13. Quality Management. HTRW Design Districts should include anomaly avoidance capability in all applicable indefinite delivery order contracts for HTRW reports, designs, or remedial actions on FUDS or active military sites. UXO/OE concerns must be addressed before initiating any HTRW field investigation activities. Prior to initiation of on-site activities, items developed for UXO support of HTRW activities (i.e., SOW and Work Plan) must be submitted to the appropriate OE Design Center and the OE MCX for review in accordance with the roles and responsibilities set forth in Chapter 1. The executing district is responsible for supervising the fieldwork and ensuring compliance with all approved plans by all USACE and contractor personnel. The OE MCX may also conduct random inspections to verify conformance. A separate on-site, full-time UXO Quality Control Specialist (UXOQCS) is not required for UXO support activities. However, the UXO support contractor must perform quality control reviews of all field activities. Upon completion of the UXO support activities, the PM will ensure an After Action Report is submitted to the OE MCX.